EMCal Calibration

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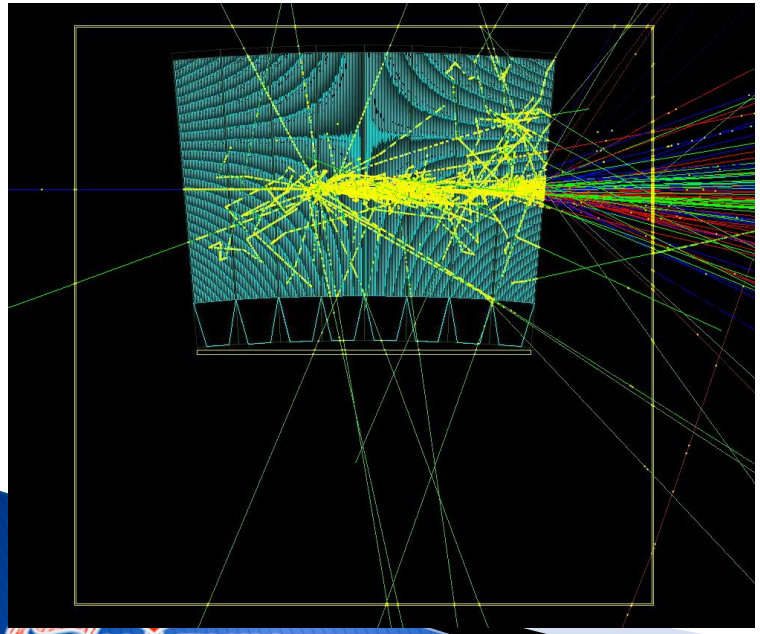
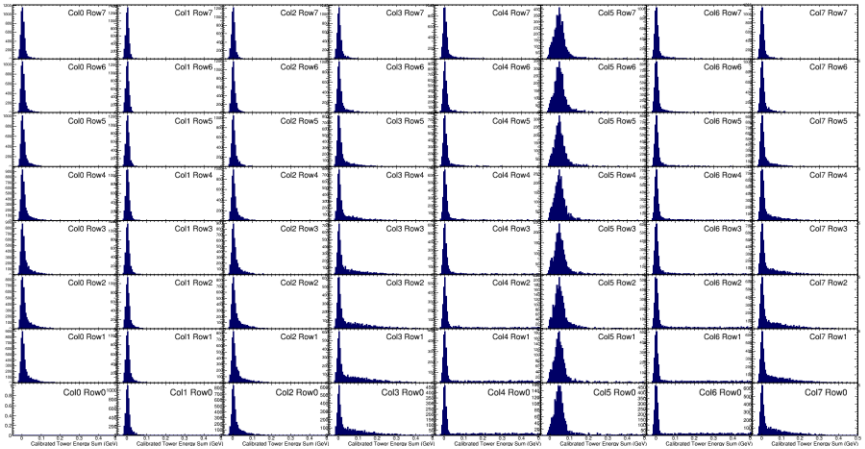
MIP calibration – the idea in sim.

- Use 120 GeV proton as high flux MIP proxy
- Scan through all columns
- Use as tower-by-tower calibration in production

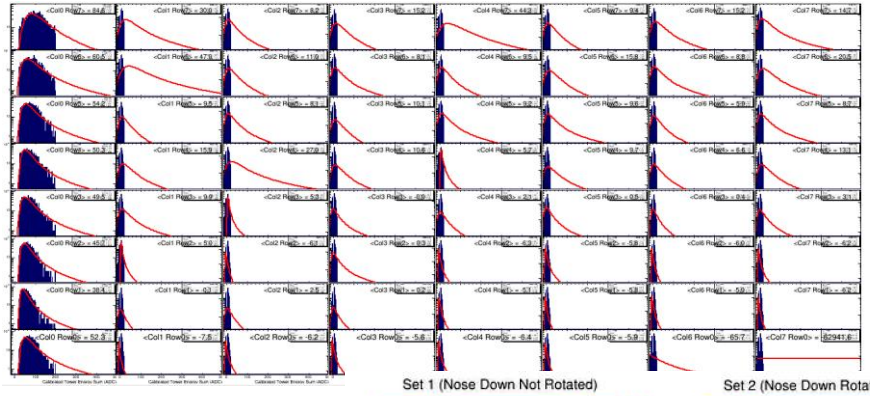


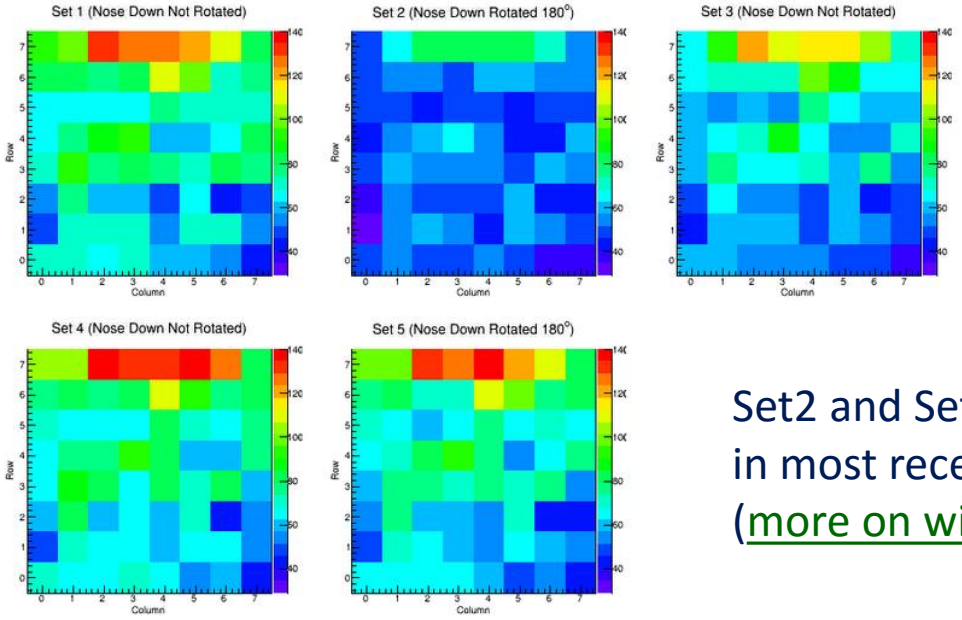
Rotated to face down for 120 GeV proton calibration



MIP calibration – Data analyzed by Mike

Subset of plots from Mike's Testbeam workfest talk:
https://indico.bnl.gov/conferenceDisplay.py?confId=2235

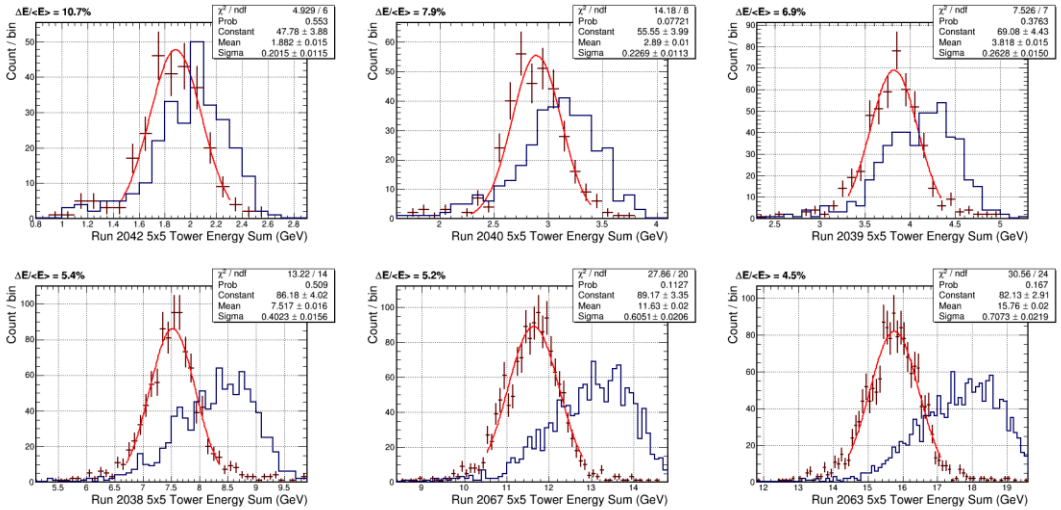




Set2 and Set4 available
in most recent productions
(more on wiki)

Shower calibration – online tests

- Temperature correction (T0, slope, T)
  - Need event time stamp
- EMCal – e-shower calibration



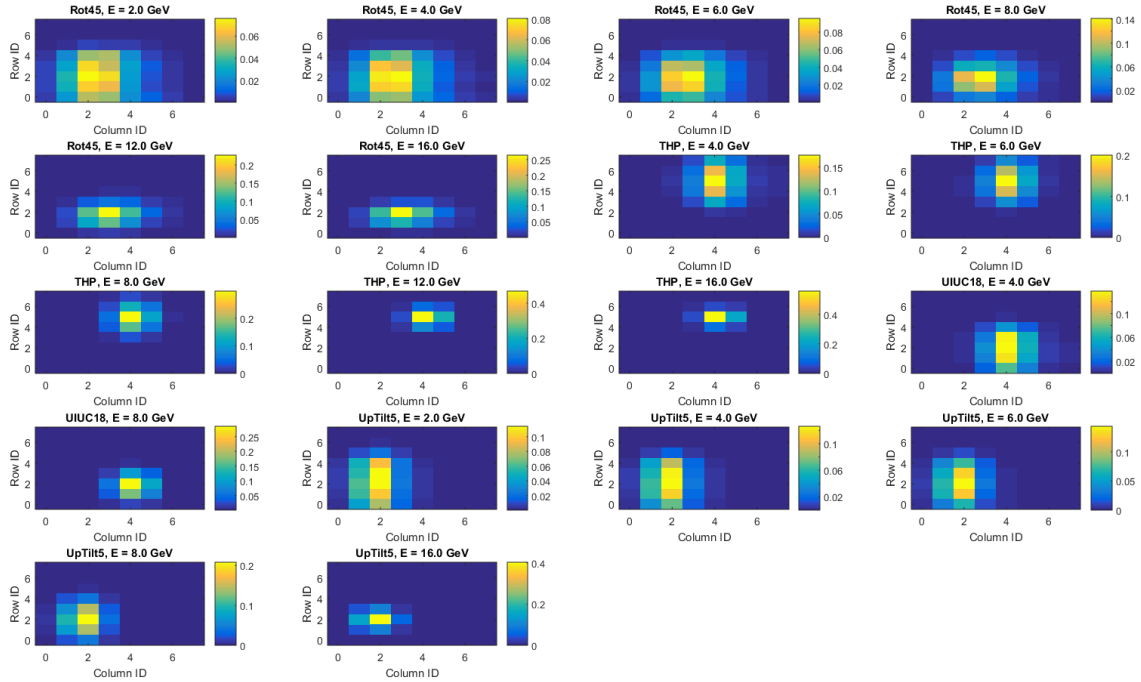
Online analysis test, 3x3 hodoscope cut
- Mike S. Set2 MIP calibration
- Further shower calibration

https://wiki.bnl.gov/sPHENIX/index.php/T-1044/EMCal_good_run_note#First_energy_scan

Shower calibration – towards final

- Use four configurations of detector setup with data sets of various beam energy to cover max number of towers
- Use temperature correction – quoting number from last presentation of Joey and Martin
- Analysis modules on GitHub, and special cut for calibration
  https://github.com/sPHENIX-Collaboration/analysis/tree/master/Prototype2/EMCal/ShowerCalib
  - No hit in veto counter (Calib E<15)
  - Valid single hodo-scope fired in H / V (Calib E > 30), accept all 8x8 hodo-scope fingers
  - Electron Cherenkov (sum c2 > 100)
  - Temperature is not crazy (25C < T < 30C)
  - Energy sum using all 64 towers
- Calibration code in matlab
  - Objective function = Sum $((E\_observ - E\_expect)/\sigma(E))^2$ is minimal
  - Allow energy scale (E_expect) to vary from each configuration

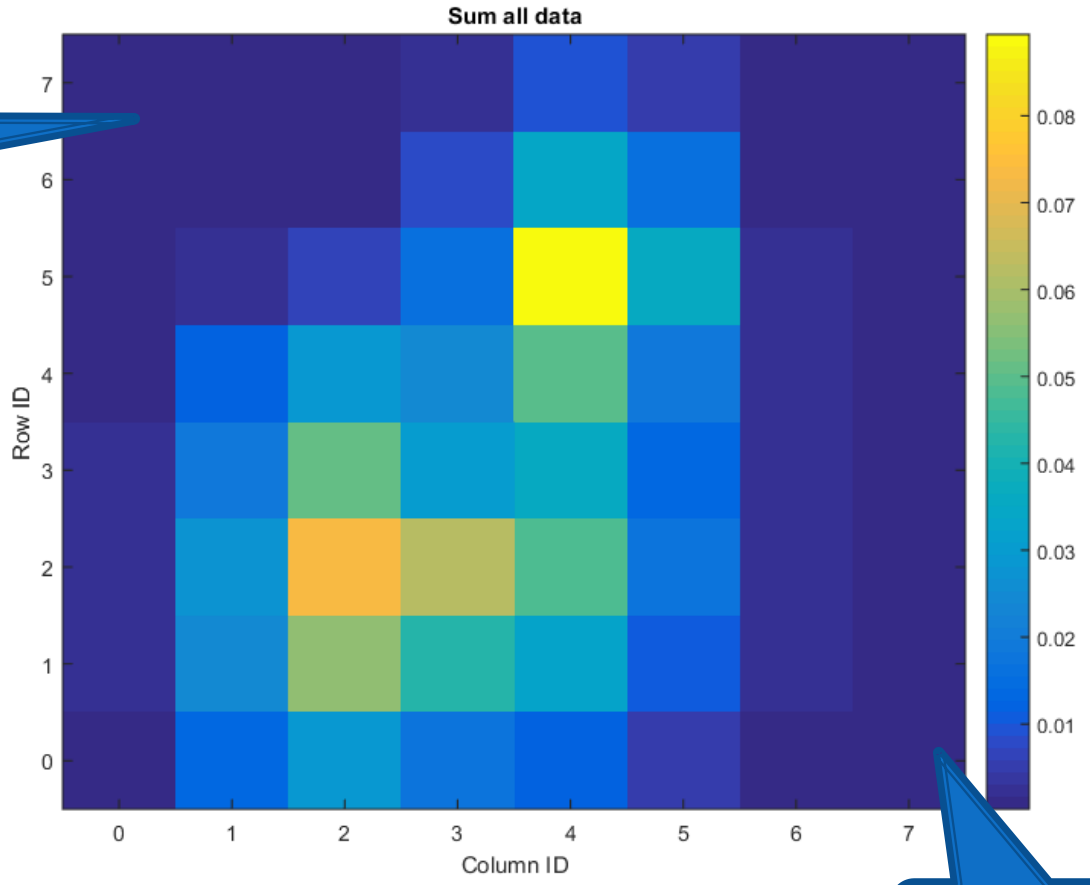
Data sets 1 of 2:
Inspect each data sets



Run numbers as linked to wiki

- https://wiki.bnl.gov/sPHENIX/index.php/T-1044/EMCal_good_run_note#Energy_Scan_.280_Degree_tilt.2C_EMCal_rotated_45_Degree.29
- https://wiki.bnl.gov/sPHENIX/index.php/T-1044/EMCal_good_run_note#Energy_Scan_.28THP_centered.2C_Tower_42.2C_70k_Events.29
- UIUC runs centered on block 18
- https://wiki.bnl.gov/sPHENIX/index.php/T-1044/joint_data_good_run_note#Energy_Scan_.28Tilt_up_by_5_Degree.29

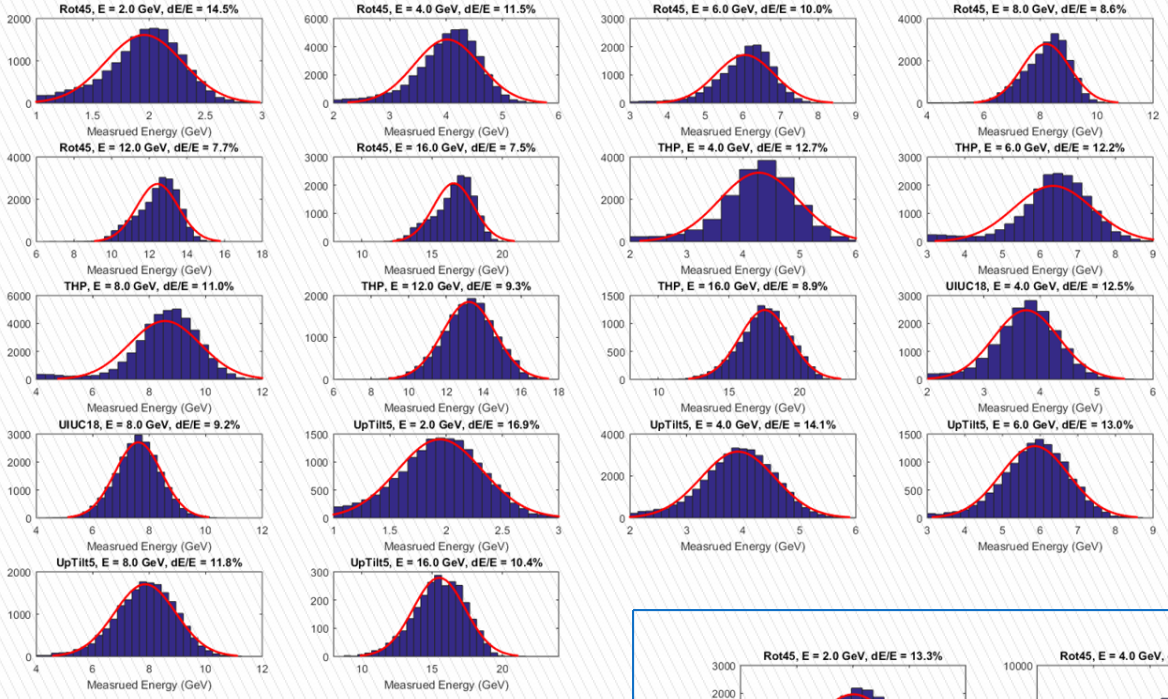
Data sets 1 of 2: Sum all data sets

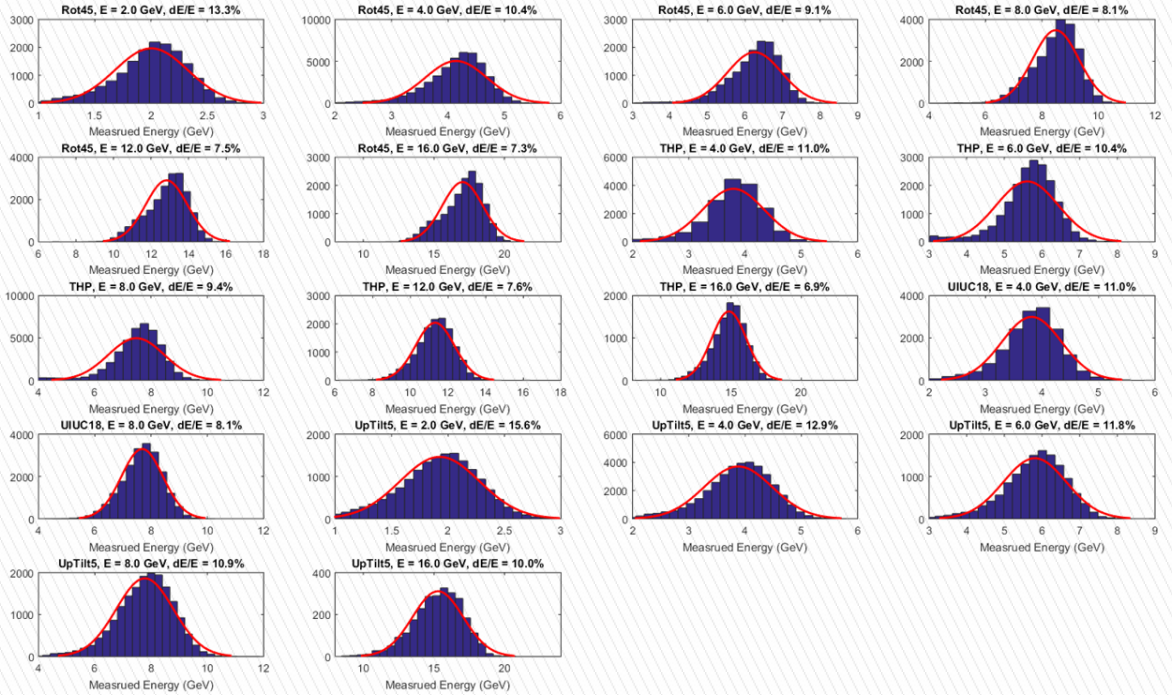


No data on THP far left

No data on UIUC far right

A trial run





- General improvement in spread in all data sets
- Significant tail remains for 45 degree tilted configuration
- THP somehow has better over resolution (note accepting 8x8 hodoscope here)
- Not as dramatic improvement for UIUC centered modules

Next…

- Refine data selection:
  - Reject 12 ang 16 GeV data for calibration due to narrow beam spot? (avoid coupling between beam position and calibration)
- Refine constrains and tail rejections
  - Online calibration: 3 iteration of with tightening tail rejection
  - This trial: 1 iteration without rejecting tails
- Apply calibration to test production and quantify resolution with analysis hodo-scope cuts
- Treatment of towers with no calibration data (but used in hadron data)
  - Expect reuse MIP calibration with some average re-scaling